What is claimed is:

1. A method for forming a plurality of beams from a reflected signal received by a transducer array having first and second receiver elements, each of said first and second receiver elements receiving the reflected signal at a phase dependent upon the position of the first receiver element relative to the second, the received signal at each of the first and second receiver elements being sampled and converted to a digital signal by first and second associated analog-to-digital converters at a sampling rate defining a time interval during which a first value representing the amplitude of the received signal at the first receiver element and a second value representing the amplitude of the received signal at the second receiver are available during said time interval, comprising the steps of:

(a) applying a first weighting factor to the first value during a first portion of the time interval to generate a first resultant for a first beam for the first receiver element;

(b) applying a second weighting factor to the first value during a second portion of the time interval to generate a second resultant for a second beam for the first receiver element;

(c) applying a third weighting factor to the second value during a third portion of the time interval to generate a third resultant for a first beam for the second receiver element;

(d) applying a fourth weighing factor to the second value during a fourth portion of the time interval to generate a fourth resultant for a second beam for the second receiver element;

(e) combining the first and third resultants to generate the first beam; and

(f) combining the second and fourth resultants to generate the second beam.

2. The method of Claim 1, further including the step of repeating steps (a) though (f) in at least one subsequent time interval.

3. The method of Claim 2, further comprising the step of changing at least one of the first, second, third and fourth weighting factors prior to said repeating steps (a) through (f).

4. The method of Claim 1, wherein the first and third portions of the time interval overlap each other and the second and fourth portions of the time interval overlap each other.

5. The method of Claim 4, wherein the first and third portions of the time interval and the second and fourth portions of the time interval coincide.

6. The method of Claim 1, wherein the number N of beams generated is greater than 2.

7. The method of Claim 6, wherein the number of receiving elements, M, is greater than 2, the received signal at each of the M receiving elements being sampled and converted to a digital signal by associated analog-to-digital converters, a plurality of weighting factors being sequentially applied to the digital signals to yield resultants, the resultants being combined into beams.

8. The method of Claim 1, wherein said steps (a) through (d) include complex phasor multiplication to achieve the phase shift to form beams, the received sample and the weighting factors having an in-phase component and a quadrature component.

9. The method of Claim 1, wherein said steps (a) though (d) include the step of multiplexing previously stored values of an analog-to-digital converter output from a plurality of connected registers, the contents of which are shifted to a subsequent connected register based upon a clock pulse, the register location of a value being dependent on how many clock pulses and how many shifts have occurred since the value was first presented to the first register of the plurality of registers and thereby related to a delay in time from when the value was first presented to the first register, said multiplexer selectively retrieving a particular value at a particular time from the plurality of registers to adjust the phase of the signal for forming a beam.

10. The method of Claim 1, wherein said step (e) is the addition of the amplitudes of said first and said third resultants, and wherein said step (f) is the addition of the amplitudes of said second and said fourth resultants.

11. The method of Claim 10, further including the step of retrieving weighting factors from a memory element, said retrieving step being performed prior to any of steps (a) through (d).

12. A system for forming a plurality of beams from a reflected signal received by a transducer array having first and second receiver elements, each of said first and second receiver elements receiving the reflected signal at a phase dependent upon the position of the first receiver element relative to the second, the received signal at each

of the first and second receiver elements being sampled and converted to a digital signal by first and second associated analog-to-digital converters at a sampling rate defining a time interval during which a first value representing the amplitude of the received signal at the first receiver element and a second value representing the amplitude of the received signal at the second receiver is available during the time interval, comprising:

(a) a time division multiplexer for sequentially applying first and second weighting factors to the first value to generate first and second resultants for forming first and second beams, respectively, said time division multiplexer sequentially applying third and fourth weighting factors to the second value to generate third and fourth resultants for forming the first and second beams, respectively; and

(b) a combiner for combining the first and third resultants to form the first beam and the second and fourth resultants to form the second beam.

13. The system of Claim 12, wherein said multiplexer includes a weighting applicator for applying a weighting factor to a value available at an output of an analog-to-digital converter, said weighting applicator having an input for receiving the output of the analog-to-digital converter and an output leading to said combiner.

14. The system of Claim 13, wherein the output leading to said combiner includes in-phase and quadrature components.

15. The system of Claim 13, wherein said combiner is a cascade combiner.

16. The system of Claim 15, further comprising a cascade delay element interposed between said output of said weighting applicator and said cascade combiner.

17. The system of Claim 16, wherein said delay element is a cascade delay pipeline.

18. The system of Claim 16, further comprising a memory element for storing weighting factors to be applied by said weighting applicator.

19. The system of Claim 18, further including a modulo (N) address counter and an addressable memory, the weighting factors being stored and retrieved from said addressable memory based upon a sequential and repeated count by the modulo (N) counter.

20. The system of Claim 19, further comprising a modulo (R) counter, where R corresponds to the possible depth of focus values, said modulo (N) and modulo (R) counters, sequentially generating all ordered pairs of potential modulo (R) and modulo (N) values and addressing each weighting factor stored in said addressable memory at the address specified by each ordered pair.

21. The system of Claim 12, wherein said multiplexer and said combiner are comprised of a plurality of node blocks, each node block receiving as an input said output of an analog–to-digital converter associated with a corresponding receiver element, said node blocks being connected serially such that the output of a first node block constitutes another input for a next node block.

22. The system of Claim 21, wherein each of said node blocks includes a weighting applicator, a cascade delay, and a cascade combiner, with the output of the cascade combiner being the output of the node block and connected to an input of a cascade combiner of the next node block.

23. The system of Claim 22, wherein said cascade delay synchronizes the output of said sequential receiver element outputs to allow the summing of said outputs as adjusted by said weighting applicator to form a beam.

24. The system of Claim 23, wherein said weighting applicator utilizes complex phasor multiplication.

25. The system of Claim 23, wherein said weighting applicator includes a series of registers through which time associated amplitude values are shifted upon receipt of a clock pulse, said weighting applicator including a multiplexer having inputs to each of said registers and capable of reading the value of any selected on of said and outputting that value as the output of said multiplexer.

26. The system of Claim 12, further comprising a processor for interpreting and displaying beam data.